

### **3.2.5 AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments**

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#### **Introduction**

Background concentrations of chemicals are the concentrations that would be expected at a site not contaminated by past or current operations and activities. Chemicals present at concentrations “sufficiently” greater than background concentrations are considered site-related contaminants (U.S. EPA, 1992a; 2002a). The comparison of site to background concentrations of chemicals, together with other lines of evidence, forms the basis for selecting the chemicals of potential concern (COPCs) to be evaluated further in human health or ecological risk assessments.

There are two main categories of background: naturally occurring and anthropogenic (U.S. EPA, 1989; 1992a; 1995; 2002a). Naturally occurring background consists of the concentrations of chemicals in the environment that do not result from human activities. Anthropogenic background consists of the concentrations of chemicals in the environment from human activities unrelated to site activities. The goal of the Environmental Restoration Program is to address risks from contamination attributable to site activities, not to alter the natural environment or to remediate anthropogenic contamination. Accordingly, cleanup goals for a site are not set below naturally occurring or anthropogenic background concentrations. Understanding the contribution of background concentrations to site risks is important in the remedial decision making process wherever the background concentrations of chemicals contribute substantially to the total risks resulting from COPCs in media contaminated through site activities.

#### **AFCEE Requirements**

Background concentrations of chemicals should be determined during the site characterization that will result in the selection of the COPCs to be evaluated in a human health or ecological risk assessment. The development of information on the background concentrations of chemicals will be supported by data quality objectives (DQOs) defined during the scoping and planning phases of an investigation (U.S. EPA, 1989; 1992a). Documentation that the background samples are comparable to site samples and representative of the background conditions for the site will be provided in the report presenting the risk assessment (U.S. EPA, 1989; 1992a; 1995; 2002a). The rationale for selecting the background area(s), background sampling locations, and the number of background samples must be consistent with the DQOs and clearly documented in the work plan (WP) or sampling and analysis plan (SAP).

The rigor and sophistication of the any statistical approach proposed to characterize the background concentrations of chemicals or to compare site concentrations to background concentrations must be defined through the DQO process. Approaches for identifying and evaluating outlier values in the data sets and spatial and temporal patterns of chemical

concentrations at the background and site areas will be presented in the WP or SAP (U.S. EPA, 2002a). Any statistical approach proposed must be justified in the WP or SAP in terms of its appropriateness, advantages, and limitations (U.S. EPA, 1989; 1992a; 1992b; 1995).

Estimates of the risks associated with the background concentrations of COPCs will be calculated and compared to the total risks calculated for the COPCs (U.S. EPA, 2002b). Uncertainties associated with the background concentrations of chemicals and the risks evaluated based on these concentrations will be discussed comprehensively in the uncertainty analysis (U.S. EPA, 1992a; 1995).

### **Recommended Practices and Guidance**

Before planning a background study, an effort should be made to determine whether background data that meet the pertinent DQOs are available from previous investigations. The quality of these data should be delineated in the document presenting the risk assessment if the data are used in the risk assessment. Literature values and background data developed for other sites should not generally be used in place of site-specific background data or to avoid collecting site-specific background data (U.S. EPA, 1992a).

Rigorous statistical analyses are not needed if the concentrations of contaminants in the site samples are clearly greater than their concentrations in the background samples. Also, the number of background samples needed may be small if the difference between site concentrations and background concentrations is expected to be obvious. Further, the number needed may be small if the chemical will most probably be detected only infrequently in the background samples (U.S. EPA, 1989; 1992a; 1995).

However, a statistical approach may be necessary to determine the number of samples needed if the difference between site and background concentrations of chemicals will probably not be obvious (U.S. EPA, 1992a; 2002a). If a statistical approach is necessary, an expert environmental statistician should be consulted before deciding on the number of background samples and the background sampling locations.

Conditions at some bases do not allow specific background areas to be clearly distinguished from contaminated areas on the base. An alternative method has been successfully applied to define background soil concentrations of inorganic contaminants under these circumstances (Cook, 1998).

### **References**

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